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ABSTRACT

Designed for elementary school use, this manual provides teachers with numerous experiments and activities to help children understand and evaluate the surrounding environment. Activities are planned to explore many aspects of the environmental problem. Suggestions for involvement in language arts, social studies, and mathematics are included along with the science activities. Units of study emphasize air pollution, water pollution, litter, land use for school yard and neighborhood, and special problems concerning rat control, odors from factories, vacant houses, junk, and hazards of sidewalks, traffic, and dumps. Each unit offers background information on the subject, learning activities requiring little or no equipment, procedures to carry out the activity and questions to consider following completion of the activity. A summary sheet is also provided listing the major concept or theme of the unit, purpose of the unit, and questions or statements to discuss and investigate while introducing, developing, extending and fixing the concept. (BL)

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WHAT IS THE E.Q.

(Environmental Quality)

of your School?

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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SP 001 592

Science Dept - Nashville - Metro - Outdoor Ed Dept.

Activities

ED052052

ENVIRONMENTAL QUALITY MANUAL

Introduction

This mini-manual has been designed for the elementary school classrooms. The experiments can be done with little or no equipment. All areas of the curriculum can be involved in this attempt to help you and the children understand and evaluate the surrounding environment.

Although this is planned to call attention to the national effort to make all citizens, both young and old, aware of the need to learn about their environment and its change, it is a type of learning that needs to be continued throughout the child's school years. We have neglected the area of Environment Education in the past years and the condition of the nation today shows this neglect. We must start with children so that they might have a national conscience that we have lacked.

It is hoped that EACH school will make a survey of the environment quality of, not only the immediate school site, but the surrounding areas. Making a survey alone is not enough. If bad conditions are found, many can be changed by the children themselves and others can be called to the attention of the proper agencies and the community.

Discussions on conditions and ideas on solutions are important also. Children are never TOO YOUNG to learn more about the problems of their environment and how they MUST GET INVOLVED themselves in order to help these problems get solved. As important as reading, writing, or arithmetic is the social awareness of themselves and their community.

The following activities are planned to explore all aspects of the environmental problems. Suggestions for involvement in language arts, social studies, and math are included with the science activities. Many activities, not included in this manual can also be done by the children. Most publishers today, as well as textbooks, are including more experiments in the area of Environment Education. These are both interesting, educational, and important to the students. They will learn much more by becoming involved in learnings that are related to what they see and hear in their community. This manual provides a start for you and the children.

What evidence of pollution can students find in their own area? Taking a local environmental inventory makes an interesting unit. Can students safely swim in near-by lakes or rivers? Have weedkillers damaged trees along the roads? Does black smoke spew out of stacks seen from classroom windows? Are near-by beaches black with oil scum? What are the sources of lake and river pollution? What is the nature of air pollutants? Has the amount of wildlife steadily decreased?

To start out the study show the children the film Environmental Awareness, 6 minutes, no talking - wonderful for discussion. Secure from the Materials Center.

ENVIRONMENTAL EDUCATION PROGRAM

School Objectives

To develop a sense of responsibility for the preservation and conservation of our natural resources

To acquire the use of the power of observation and curiosity about natural phenomena as an avenue of learning

To promote a desire and a will to protect living and non-living resources important to man and to use them wisely

To realize that interrelationships exist between living organisms and their physical environment

To identify the natural changes in the environment and develop a sober and salutary attitude toward the changes

To strengthen the senses through close and accurate observation

To promote the growth of a spirit of inquiry and the broadening of interests

To manifest the cognitive processes of comprehension, analysis, and synthesis through stimulating and creative learning experiences

To visibilize the foundation and relationship of man's artistic and scientific achievement to the natural world

To move the learning experience from an entirely artificial setting in the classroom to the real life environment

To provide learning activities that cannot be structured in the classroom

To provide activities which associate and connect learning and living and to enable students to achieve better academic success

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UNIT I
AIR POLLUTION

Air acts to red the earth of wastes. It acts in such a way that it makes itself pure. Today the air is in danger. We are putting more waste into the air than it can rid itself. This adding of waste material to the air is called pollution.

There are many ways in which the atmosphere becomes polluted. Some are caused by man and others come from the action of nature. A product of burning is carbon dioxide. All fuels which come from living, or once living matter, contain carbon dioxide. When they burn, carbon mixes with oxygen in the air to form carbon dioxide. Some carbon dioxide is taken out of the air by plants. Man has added to the amount of carbon dioxide in the air by large amounts. Since it traps the sun's rays, the temperature of the atmosphere rises. Scientists believe that if this goes on, many forms of life will not survive. Other things in the air are nitrogen; cars give off nitric oxide; some of these can be poisonous, some good. Some forms of sulfur in the air can harm eyes, skin, and lungs.

The air that makes city dwellers sneeze and wheeze cost every American $65 per year--a total of $11 billion in medical bills, corrosion, crop damage, cleaning, and so on. Can students cite examples of these expenses?

Scientists say that if air pollution is not halted by 1985 the amount of sunlight reaching the earth will be reduced by one half. Today air pollution shuts out 45 percent of the sunlight over Los Angeles and 25 percent of it over New York City. An estimated 5 percent is shut out over rural areas. Have students discuss why this is so. They may want to guess how much sunlight their area receives.

When the atmosphere can no longer handle the waste, serious things can happen. Smog, a mixture of fog and smoke, often hangs over large cities. Air pollution can cause sickness and death.

AIR POLLUTION ACTIVITY

Materials: Vacuum cleaner, Filter paper

Put filter paper or disk over pipe where the bag would usually be. Use pipe without a fixture on the end.

Put clearner with the pipe outside a window. Let it run for about 1/2 hour. Do the same with several windows around the school. Try it at different times of the day and in different kinds of weather. If possible, by using an extenion cord, put the cleaner out away from the building towards a street. (Can be done during play period so someone can watch it).

Compare the filters taken from each of the times, different days and different times of day.

Questions:

At what time of day does the filter show more pollution? Why? (If in morning, more cars on the roads. Sun has not heated up the air so that dust etc. will rise).

AIR POLLUTION QUESTIONS (Continued)

Was there any area of the school that had more pollution? Why? (This might be near a street or a house burning trash, etc.)

Are there any stores, factories in the area that might make more pollution for this area? (Check and use smoke chart)

Does weather have anything to do with air pollution? (On windy or wet days there will be less pollution in the air)

Can you <u>see</u> the pollution? (In some schools the "cloud" over Nashville can be seen very well, particually in the early morning)

Would certain times of year be more likely to have pollution? Winter, because of fires and coal burning.

Put the cleaner next to a car exhaust pipe and run it for a while. Try several cara.

What makes the filter so dirty? (Lead in the gas and other chemicals.)

Would a bus or truck have more pollution then a car? (Yes)

How could car pollution be made better? (New types of cars, electric or steam, less driving by one or two people, more mass transportation)

Some discussion here on why the new types of cars would be hard to use. See current materials in papers and magazines for articles on possible new cars. Suggestions on taking lead from gas or new ways to stop the pollution. Sixty-percent of air pollution comes from the car.

DETERMINING AIR POLLUTION

Most cities and suburbs have air pollution problems. Each day, factories, apartment houses, cars and trucks send tons of pollutants into the air. In a large city many tons of pollutants are released into the air during a 24-hour period.

How much pollution is there in your area? Let's find out.

Equipment: Microscope slides (or glass plates)
Petroleum jelly
Sheet of white paper
Masking tape
Magnifying glass (or microscope)

What to Do

Coat one side of each slide with petroleum jelly. Select several different areas within your city or suburb to place the slides. Some possible locations: school or home rooftop; friend's home; window ledge. Lable the location of each slide on masking tape that you attach to the slide. Also write the location of each slide in the box below.

Hang the slide from a clothesline or other similar support. If this is impossible, the slide may be placed flat on a surface. Expose all the slides about the same length of time (one day, two days, a week).

After collecting the slides, place them on a sheet of white paper, with the coated side up. Examine them under strong light with a magnifying glass or under a microscope. Compare these slides with slides that were kept indoors in a closed box or drawer.

DETERMINING AIR POLLUTION (Continued)

Observations

Are there any particles on the surface of the slide? What kind and amount? Describe the particles in the box below. What area had the dirtiest slide? the cleanest? Are all the particles the products of man or are some natural?

Try to find a way to determine the hours of the day when most pollution occurs and also which days in the week.

Can you find the source of some of this pollution? In what ways could this pollution be reduced? Divide your suggestions into individual, community or neighborhood, industrial, and governmental responsibility.

What can you and your friends do to help?

POLLUTION IN THE AIR

LOCATION	TIME EXPOSED	DESCRIPTION OF PARTICLES	AMOUNT OF POLLUTION

QUESTIONS:

Why would the particles we see on the slide be bad for us? (Get in nose, lungs).

Where might they have come from? (Smoke, car fumes, waste).

How could the pollutants seen here be controlled? (Depending on what they are--stop burning coal, change method of engine, finish job nearby of blasting or construction).

AIR POLLUTION (Continued)

C. Hang a damp, white piece of cloth outside for a week. After the week is up, check the cloth to see how much dust and other material has fallen on it. Answer same question.

Why would the particles we see on the slide be bad for us?
(get in nose, lungs)
Where might they have come from?
(smoke, car fumes, waste)
How could the pollutants seen here be controlled?
(depending on what they are--stop burning coal, change method of engine, finish job nearby of blasting or construction)

D. Put a bucket of clean water outside before or during a rain. Strain the water; check the pollution.

Questions:

Why would rain have pollution in it?
What might this do to the soil?
(some pollutants would be bad, retroactive, materials can be absorbed by plants and when eaten by animals, come back to man. Some would be good, nitrogen is needed by plant and that in the air can become mixed with rain and returned to soil.)

On TV weather, some weathermen will report on air pollution for that day. Keep a chart of what is said. See if you can tell if there are certain days on which more pollution seems to occur. Record what type of a day it was. Try to see if there is any connection between the type of weather and the amount of pollution. Does the barometer reading change with the pollution? How about humidity of the atmosphere?

E. Use a special chart to figure amount of pollution in smoke air pollution.

Using the Ringelmann Smoke Chart-- Insert in proper place. The smoke chart is used to determine if smoke missions are within the law. The chart shows graduated shades of gray, in equal steps from white to black. Since carbon is usually the worst pollutant the color help in deciding if there is a great amount of air pollution from the smoke. To use the chart, support it on level with the eye, at such a distance from the observer that the lines on the chart merge into shades of gray, and as nearly as possible in line with the stack. The observer glances from the smoke as it issues from the stack to the chart and notes the number most nearly corresponding with the shade of the smoke, then records this number. A clear stack is recorded as No.-100 percent black smoke as No. 5. This can be done several times a day to see if the same density continues. The "law" in Nashville, based on this chart.

Other Things to Do:

Watch for new items about air pollution--put on board or make a scrapbook.
Draw posters and cartoons about air pollution.
Discuss possible laws that could be passed about air pollution.
Find out what has been passed
Discuss what kinds of health problems can result from air pollution.

AIR POLLUTION

LESSON 28

Concept Conservation of pure air is necessary in a growing industrial nation.

Purpose of Lesson To help students understand the effects of air pollution.

Introducing the Concept Take the class on a field trip to view air pollution. The microringlemann chart should be used, if available.

Do you see smoke coming from the chimneys?
Do you see smoke coming from automobile exhausts?
What gases are being poured into the air?
How does the weather affect air pollution?

Developing the Concept Discuss the following statements. Try to relate them to some incident that has ahppened in the community.

Air pollution kills, costs, and cripples.
Air pollution may affect living cells.
Air pollution deteriorates property.
Air pollution destroys outdoor statues and art works.
Air pollution may cause respiratory diseases.
Air pollution affects the weather.
Air pollution means fuel wastes.
Air pollution causes grit, odor, and dirt in manufactured goods.

Extending the Concept Have pupils investigate:

What was the pollution disaster in Donora, Pennsylvania?
Why does London have killer fogs?
What causes smog on the Los Angeles freeways?
Where does pollution come from?
What causes changes in pollutants when they get into the air?
What are the types of air pollutants?
What legislation is necessary to reduce air pollution?
What research is being done to reduce air pollution?
What is the Cottrell process?
Why does improper burning of fuels produce waste of heat energy?
With a map of your community, locate sources and types of air pollution which exist there. Secure information concerning our community's ratio of air pollution to parts of pure air. What laws does your state have to control air pollution? (Resource visitor from Air Pollution Authority is available.)

Fixing the Concept

Will our community continue to have a pure air supply?
How does our community attack the pollution of air problem at this time?

UNIT II WATER

We can live without many things, but not without air and water. This air and water must be pure. Water is a gift of nauture that we have always taken for granted. It flowed through the earth and formed lakes and streams. Then as cities and towns began to grow, people's life became changed. Some thing frightening began to happen. Pure water became unpure. Poisons, seen and unseen, surrounded many communities. The waste created by people and animals and industry were buried or dumped into the water. If it was left on the ground, much of it was washed by heavy rains into the rivers and streams. As sewer systems were created, so were other problems. Now, waste that once was spread over a wide area was brought together and discharged into the waterways in a concentrated form. The poisons in this concentrated mass killed many living things in the rivers. It cut off oxygen from others. The water now could not be used for drinking or swimming, and the fish and other animals that lived in it would die. Detergents, thought to be an advantage over old types of soaps were widely used. The suds, however, did not disappear as soap bubbles did; they soon clogged up many streams. People using the edge of the stream or river would throw trash into the water. Oil and other trash came from boats. Many factories emptied their waste into the rivers. The rivers could no longer handle all the poisons and many of them "died", losing the life in them and making them unfit for use for water or recreation. This is water pollution.

A. Experiment - In Classroom - Detergent Suds

Use a bar of soap and some detergent; form each up and put one at a time into the sink. See what happens to the suds (time them).

Questions:

Which disappears first?
Why would suds hurt a plant? (try watering a plant with sudsy water)
Why does it take so long for the detergent suds to disappear? (shemical there as a cleaning agent)
How have we heard on TV about these detergents hurting something? (ad on "hurt" hands - dish washing)

B. Study - In Classroom - Our Drinking Water

Start by placing water in glasses on a table, one from the tap, one from a stream in the community (preferably a muddy stream).

Question: Which glass would you want to drink?

Questions for discussion:

Do we need water?
What happens if we run out of water?
What is the source of our community's drinking water?
Can we use the water in a lake, stream, or pond for water?
What are other sources of drinking water?
Describe how water is treated tomake it safe for people to drink.

C. Is the Water We Drink Hear PURE Water?

The class can be divided into committies to discuss these questions and report to the class. A trip to a water treatment plant would be good reference.

How Pure is Drinking Water?

Put about 1/2 cup of regular tap water into a clean aluminum foil pan. Evaporated all of the water by heating the pan over a hot plate. Note the white minerals or scum that appear. Was the water pure? Repeat the=same activity using distilled water. Discuss the differences. Display the pans showing the minerals present in drinking water compared to those present in the more pure distilled water.

D. Trip to a Polluted Body of Water

There are streams or rivers within walking distance of many schools. These may be used to study pollution.

Questions to be answered:

List signs of pollution

Natural Pollution	Man-made Pollutants
silt	sewage
acidity from swaps and bogs	trash
driftwood	driftwood
decomposed plant and animal matter	dead fish or animals
dissolved minerals	thermal changes - out of season (hot areas chemicals (oil slicks, dyes)
	odors

(Adapted from Water-Waste of Plenty, Raffo)

Pollutants in water often make a water more acid. This can be tested by dipping strips of litmus paper into the water. Try this both in a stream and in drinking water. If the paper turns blue, acid is present and possibly pollution is also present. This can be done in areas where the water LOOKS clean but may have pollution in it from further up the stream. (Litmus paper is available to Title I schools from the Outdoor Education Department.)

Back in the classroom some observations may be discussed:

Can the effect of man be detected?
What sign of man are not harmful to the water?
What simple steps might correct some of the problems you have observed?

If the water is a stream, try to trace some of the pollution. (trash piles, factories or businesses, houses, etc.)

What can be done to stop these people or businesses from polluting the stream?
Laws? Enforcement of laws already in existance?
Pressure by the community?
What agency would a community go to in order to get help?
How would a private person report this?
How could the members of an elementary class help?
(Pick up litter; try to talk to peers and neighborhood.)

(This is a good chance to discuss such things as pickets - What is good? Call attention to the problem. What is bad? Can be overdone and lead to violence if tempers are allowed to flare up. The children have read about such things; they should be discussed pro and con.)

E. How Does Pollution Kill in a Stream? Does All Pollution Kill?

Use water from polluted stream if possible. If water from stream is not polluted, add chemical. Use silted (natural) and man-made with detergents. Put water plant into jars with both types of water. Watch the plant.

Why do directions for starting an aquarium or having goldfish always say do not use water directly from the tap for the fish? (water has chemical in it to make it fit to drink.) Why would letting it stay in a jar for several days make it fit for the fish? What would the chemical do to the fish? Is this chemical like pollutants? (Fish must have oxygen.) The chemical takes the oxygne from water. Water that sits will pick up more oxygen from the air and allow the clorine in the water to evaporate.

F. In the Section on Erosion are several Concepts that Fit with This Session. They May Be Used With Water Pollution Also.

G. Check the Water System for Your Community:

Is the water coming to us by way of well? reservoir? or river?
What must be done to it to make it fit to drink?
Does the water have a distinct taste?
How does this treated water get to your house?
What controls are put on the water by the city?
What disease can come from polluted water from weels? (typhoid fever)
Would rain water straight from the clouds be polluted?
Why did the Health Department suggest that you not eat snow last winter? (snow picked up pollutants in the air, brought them to earth)
How could the following materials halp purify water?
alum, sand, lime, chlorine, gravel, carbon

H. Water Can Be Made Cleaner by the Filtering Process.

FILTERING WATER

WHAT DO WE WANT TO FIND OUT?
How can we filter dirt from water?

HOW CAN WE FIND OUT?
Half-fill a small funnel first with small gravel and cover with clean sand. Place the funnel in the mouth of a glass container, such as a quart mason jar. Pour muddy water slowly into the funnel and let it soak through the sand and gravel.

WHAT HAPPENS?
The water that drains into the glass container is much clearer than the muddy water poured into the sand-gravel mixture.

WHY DID IT HAPPEN?
The sand particles "strained" the tiny dirt particles from the water. What does "strain" mean? Does it have any other meaning?

OTHER THINGS TO DO
1. When filtered the first time, the muddy water may be somewhate cloudy with very fine dirt particles. Pour the water through the sand the second time. What happened?
2. Keep filtering dirty water until you notice that the result is gradually becoming dirtier. Why does the filter not function indefinitely?
3. Try the experiment again, but with uncleaned sand. What happens? Why?

HAVE YOU OBSERVED. . .

. . .Other types of cistern filters made of charcoal, cement blocks, or unglazed bricks? How could these materials filter water?

. . .our well water is filtered by nature's filters: soil, sand, and gravel as it soaks down tothe underground water table? What is the water table?

. . .That as water is absorbed through the earth's crust it dissolves many minerals, resulting in the "hard water" we obtain from wells? Why isn't cistern water "hard?" What does "hard" mean here? Is there also "soft" water"

MISCONCEPTION?
Caution children that filtered cistern water is not necessarily bacteria-free and suitable for drinking. Consider that the types of dirt, soot, and even bird-droppings that could drain into a cistern.

MATERIALS:
Funnel, mason jar, clean sand, uncleaned sand, muddy water.

I. Another Method to Clean "Muddy Water"

INTERMEDIATE LEVEL ACTIVITIES

Half-fill a clean liquid duplicator can with muddy water (Can A) and place it on a hot plate or over a Bunsen Burner to boil. Fill Can B with crushed ice. snow, or very cold water. Hold or support Can B in the position as shown, with a glass jar below the lower edge to catch the water as it drops. The muddy water will boil, causing the water to evaporate, thus leaving mud in Can A. The collness of Can B will cause the water vapor from Can A to condense on the surface as pure distilled water. As more vapor condenses, the droplets of water will collect and drop off into the collecting jar. Compare and discuss the differences in the appearances and properties of the muddy water left in Can A with pure collected water in the jar. The collected water could be evaporated from a clean aluminum foil pan and compared with the results of Activity 75, HOW PURE IS DRINKING WATER? (Note: The muddy water has been distilled.)

J. Keeping up with problems:

Have children clip from newspapers any reference to a problem with waste materials; fish killed in river, oil in stream that caught fire, recent exposion of sewage plant that made raw sewage put in sewage, oil on oceans that killed birds, etc.

Why would oysters in polluted waters spread disease?

Other things to do:

Make posters on Clean Water
Write letters to the Governor about a problem in your community.
List ten ways you use water in your home.
Measure to see how many gallons of water it takes to fill your bath tub.
Allow a small amount of tap water to stand in a glass until the water evaporates. Is there a white ring left on the glass? Where did it come from?
Get material from the state and city water pollution office; give it to parents and neighbors.
Draw a picture of a water treatment plant and how it works.
Try filtering out clean water with a cloth or gravel or carbon as is done in a plant.

WATER POLLUTION

Concept: The amount of usable water available on the planet earth reduced by pollution.

Purpose of Lesson: To help students understand the effect of pollution our water supply.

Introducing the Concept: Take trip to observe pollution in a stream, lake, pond, or irrigation ditch.

Developing the Concept Ask:
How do you like this mess?
Do we drink water from such polluted streams?
Where do people in other areas obtain their drinking water?
Why has water pollution become such a national problem?
How does the pollution affect our local industry?
What do our industries do with their wastes?

Developing the Concept (Continued)

Make a list. Have students discuss how each one of these might be potential water polluter.

Garbage-grinder
Canning plants - packing houses
Textile industries
Coal Mines (sulfuric acid)
Oil wells
Chemical plants
Detergents - washing machines
Pulp and paper mills
Insecticides
Weed poisoning
Sewage
Bacteria
Picnicker
Home garbage
"Little bug"

FOLLOW UP TO SEE IF WATER IS STILL DISTILLED

Still Distilled?

Pour a cupful of garden soil into a quart fruit jar. Fill the jar with distilled water, screw the cover on tightly, and shake the jar to mix the contents. Allow the jar to be undisturbed for about two weeks. Observe and compare the settling process as in Avtivicy 58, Settle and See. At the end of a two-week period compare and discuss the "pureness" of the water in the jar. The top levels should be very clear, but is this distilled water?

Dip a small amount of the clear water out of the jar and evaporate it in a clean aluminum foil pan. Equal amounts of distilled water and drinking water should also be evaporated. Compare and discuss the presence or absence of mineral residue or scum in the three pans. Since garden soil is rich in soluable minerals which the distilled water has dissolved, this water is no longer pure. Drinking water and well water also contain similar minerals that have been dissolved. Distilled water is pure with no mineral scum remaining after evaporation.

References: Available in many libraries or for Title I school from Outdoor Education Department

Books:
Let's go to Stop Water Pollution--Michael Chester--Putman
Clean Air--Sparkling Water--Dorothy Shuttlesworth--Doubleday
Exploring Water--Fellger--Benefic Press
Water: The Waste of Plenty--John Raffo--Environmental Center Sourther N. J.
Teachers Guide to Conservation Education--4,5,6--Brennan--Ferguson
Let's Look Under the City--Schneider--Scott, Foresman
Water--Heindl--Coward--McCann

Films:
Environmental Awareness--United States Forest Service--Material Center
The Litter Bug--2105--Modern Talking Pictures
1234 Spruce Street
Philadelphia, Penn.
Wild River--Modern Talking Pictures
1234 Spruce Street
Philadelphia, Penn.
Pure Water and Public Health--Modern Talking Pictures
1234 Spruce Street
Philadelphia, Penn.
Conserving our Water Material Center

FILTERING WATER

UNIT III

LITTER

Our nation has more litter than any country in the world. One of the main problems in our country has always been waste. We have developed a large amount of goods for everyone and have placed the emphasis on packages and containers, no-deposit bottles and cans. Without any ideas or methods for re-using most of this, the result has been more waste. Billions are spent each year just to pick up trash. This is one area where every child can help. If they can be taught to take care of the land and not litter, a great step will be taken to help solve this problem.

It cost $.35 in taxes to pick up a pop bottle, candy wrapper, or other similar item discarded along our highways and in our parks. Take a walk with the class around the school grounds or a nearby park, picking up bottles and papers, and putting them in trash cans. Have someone keep a record of the items picked up. How much did the class save the taxpayers?

You can make a math lesson out of the fact that one American is responsible for one ton of garbage per year. How many pounds is that per person each day? What happens to all that garbage?

Activities:

A. Make a litter survey on the school site (different classes can take different spots. If there are some very bad areas NEAR the school as a vacant lot, etc., this should be included. Once the survey has been completed, it can be used as a projection of other areas, that is,if an area this size has this amount of litter, figure out what the entire block might have. A sample litter survey is below. The litter should be collected; many things can be done with it. This should be discussed with the children:

1. Should it be burned? (no, puts pollution into the air)
2. If we put it into the dumpster, where does it go? (check this out)
3. Could any part of it be used over again? (paper made back into pulp, metal remelted?)
4. What could we do with it? (pop art might be made with some; If there are plastic bottles, there are many ideas (list from Outdoor Education Department); pieces of plastic cut to make mosaic; scrap wood and other materials can be used in crafts; paper that might not be too bad can be made into paper mache.

Let the children come up with some ideas, both for this litter and for the problem of litter.

Questions:

What could be done to stop people throwing away cans and bottles? (put a higher deposit on them; re-use metal in cans; do away with no-deposit bottles; Companies have contest or campaign to get back cans or bottles)
What other benefits other than re-use of waste would there be in turning the scrap paper back to pulp? (less trees would need to be cut down for pulp, more into lumber)
What could glass bottles be used for? (there is an experiment now being tried that crushed the glass up and uses it for the bottom layer of highways instead of gravel)

Could the glass be remelted?
Is there any use for scrap plastic? (?)
Why can't scrap metal be reused? (It could, but so far most companies feel it is too expensive to get the machinery necessary.)

B. What about the waste taken from the school and all garbage cans, etc each day? (Some garbage could be turned into fertilizer for crops. A German city and one U.S. city are now using special machinery that uses all forms of trash and waste as power - even the smoke is used, but the machinery is expensive to install.

Let the children "brain storm" on this; they might come up with some good answers; record all of them. Br ng out that in the long run, it would be better to find a method to use the waste (such as the power plant) than to allow the waste to pile up.

C. Discuss the litter problem in relation to the school. Have the children look around them; check the waste basket. Need all the BE litter? Don't we waste a lot because we have so much? Isn't this a place for conservation - in materials, in equipment, etc.? Have each child try to conserve his paper, pencils, crayons, etc. for a short period of time. Discuss what this could mean in money - a little bit to them but if everyone did it, a great deal would be saved.

Discuss containers, why our nation seems to have to have fancy boxes, etc. Does this really make the product better? How could we cut down the cost of the waste by using less containers? Would this cut down the cost of the item? (They can check this out by comparing a new item in the store, ie the "new potato chip" in a special box with the same amount in a bag.)

D. Organize a Litter Police. At a certain time each day allow the members to go out and collect the litter from the school yard. Make it important with a badge, sack, etc. - an honor.

E. Make posters about litter.

F. Write letters to some of the soft drink companies urging them to stop putting out no-deposit bottles and asking that cans be redeemed also. It is never too early to help the children understand their voices can help in a campaign if done correctly.

If the children have come up with some original ideas on how to use bottle tops or cans, send these ideas to the companies also. If your school has a kiln, broken glass can be used as glaze in the bottom of a bowl, etc.

Use the big plastic garbage bags to gather the litter. Watch for the broken glass and instruct the children in how to handle it and any sharp items. If they have a doubt, have them come to you.

G. Concept: It is the responsibility of every adult and child to dispose of trash in a suitable way, in order to prevent litterbugging and to keep American beautiful.

Problem: Is it possible to tell from the kinds of trash deposited on the sidewalks and streets on the way to and from the school the ages of the litterbugs.

Materials: Large, paper shopping bags.

Procedure: The children fill their paper bags with the refuse found on their way to and from school and the teacher lists on the chalk board the amounts and kinds of materials contributed by each child. The things that are tossed aside by adults as well as by children should indicate that litterbugging is not restricted to any particular age group.

Explanation: Litterbugging has become a national problem, which should be considered both in terms of what can be done about the disposal of trash and how the removal of the debris affects the tax dollars which parent must pay.

Sample Litter Chart Area_____ Where Found_____

Plastic

1 piece of bottle
3 coffee cups
1 meat tray, etc.
9 plastic bags

Bottles

(No-deposit)
8 Pop
10 beer
3 salad dressing
(Deposit)
10 Pop (use money for treat)
2 beer

Cans

5 beer
8 pop
3 juice

Bottle tops

15 tabs from cans
25 tops

Paper

newspaper
2 cardboard boxes
9 flyers
4 labels

Metal

1 hub cap
3 broken tools
4 parts of window
11 nails
broken toy

Other Glass

23 parts of bottles and jars
7 pieces of window glass

Other

broken crayons
old rags
piece of car tire

Categories can be added as children find different things. If the material is gathered and then separated into piles, it can more easily be counted and some idea of what could be done with it be made.

To make this a meaningful experience the children must understand that they have a job to do in NOT LITTERING THEMSELVES.

ROOM LITTER ACTIVITY (Good for Lower Grades)

Materials: Scotch tape, (strip for each child) piece of white paper, (for each child), something to scrape particles from tape to paper.

Have each child put the strip of tape on the floor, sticky side down, beside his own desk. Pick it up and scrape what is stuck to it onto his piece of white paper. Look at what is there.

Questions:

What is on the paper? Where might it have come from? (dirt, hairs, lint, etc.)
Why might even this be bad for us? (Dirt might bring in germs, dust get into our lungs)
What can we do to help keep the room cleaner? (Scrape shoes before coming in, keep floor swept.
If window is open can things blow in? Will this bother us? (Smells, smoke, etc. can be bad. Some good smells and if air is clean.)
How can inside air be made cleaner? Air conditions help and filters.

Check Room: A spot check. To see what is litter. Paper on floor, crayons, etc.

Questions:
Why is paper on the floor bad? (Looks bad, wastespaper, figure out cost of the "waste" paper found on the floor for a week.
Wouldn't it be better to save this paper and spend this money on something else?
How can we help to save and conserve--crayons, paper, soap, etc? Use only what you need and try not to make mistakes on the papers you write on. In the restroom use only one towel. (This can be used to teacher the proper use of towels, soap, tolet paper, etc.)

Taken from article in Grade Teacher by Herbet Kohl

HOUSEHOLD WISDOM

We have not been very wise with respect to the care of our earth household. Man produces more than he consumes and accumulates waste products that poison his environment and which may eventually destroy life.

The classroom is an ideal place for the young to begin to learn about the care of the environment. It is possible to study ecology in a formal way. It is also possible to live it.

One way to begin is to survey the waste that accumulates in the classroom during the course of a day or week and see how much of it can be used instead of dumped.

In the classroom there are usually a number of organic waste products such as chewing gum, candy, banana peels, apple rinds and bread crumbs. These products are usually dumped into the same can as nonorganic wasted like paper, old pencils, plastic pens, uaed notebooks, etc. Yet these two categories of waste products cannot be disposed of in the same way. The organic waste, in fact, can be used very profitably if one has a small gardening plot in the school, for they can be used to create a compost heap that will develop fertilizer for the garden. In fact, two waste baskets--one marked organic and one nonorganic--can be the beginning of wise housekeeping in the classroom.

There is a lot that can be done with nonorganic waste. Old papers can be used to make papier mache or worked into collages and paintings. They can be used as note scraps, as towels, as wrappings for packages. Pencil stubs can be broken apart and the wood used as small constructions while the lead can be accumulated and used in mechanical pencils. The parts of plastic pens can also be used in many ways. The springs can be used for scientific experimentation, the cartridges for collages and constructions that can decorate the room. I have seen, for example, a wall constructed out of old ball-point pens glued together. The wall is constantly added to as new waste develops and is very functional in the classroom as a divider to make private spaces.

One need not confine the class to studying ways of using waste products in the classroom alone. In our school we have a class in automotive mechanics. The class has spent a lot of time going to junkyards and empty lots where the students have found old engines and carburetors and gear boxes. They have also learned how to make their own tools out of discarded scraps of metal and wood. With a soldering iron, a hack saw and a few other tools, students can make hammers, screwdrivers, drills, etc. In this way, they can see the transformation of waste products into useful objects.

USEFUL WASTE

There are a lot of other wastes that can be collected and reused in the schools. Old clothes can be used for costumes, or remade into new clothes. Advertisements, old posters and discarded billboard sections make wonderful reading material and decorations. Last year I found a "sign graveyard" near our school. A large lot was filled with old signs. There were 10-foot-tall letters, large soda bottles and such. We asked for some of the signs for our school and were given them. The letters and figures were worked into a fantasy playground. Other letters and figures were taken apart and the wood and metal were used for other purposes.

We found that mattress factories have more scraps than they can sensibly dispose of, and so we used them to stuff animals and to weave large tapestries.

USEFUL WASTE (Continued)

In a modest way students can help to develop ways of managing our earth household more wisely. They can be told about the interrelationships of various forms of life and can study life systems. But they can also begin to act upon their own to waste less and want less. They can use their ingenuity in developing new uses for old things and find ways of making our environment less cluttered. Perhaps they can even influence their parents to care more about the way in which they use or discard objects.

LAND USE
UNIT IV

As cities grow larger and larger and there is very little land left for pleasure, care must be taken to try to keep "green Island" within the city. Hopefully new school sites will be chosen with this in mind, but where schools are already built such "islands" must be found and utlized. There are several possibilities for their uses. The following suggestions are but a few. The important thing is to follow up on the activities. Children should learn to take an interest in their community, and they can often influence their parents into action. The kind of action needed to fight the war on urban ills and pollution. *Green growth is Earth's only producer of oxygen. For every trailer truck that diffuses carbon dioxide into the air, 100 large healthy trees are needed to convert it back to oxygen. Make a survey of recent development projects in your area. Have builders and architects made an effort to leave trees in thellandscape?

A. Use the school site or adjacent as an Outdoor Lab. Make a nature trail around the edge of the school site or in an unused area. (Some ideas on how to do this available from Outdoor Education Department) Let children lay out trail and act as guides for the school. Each grade might take the trail with a different emphasis, (ecology, animal, homes, plants and trees). Talking cards (baggage tags lettered and dipped into parafin) can be put on trees and plants. Special types of plants could be planted (those used by the pioneers). Rocks with fossils can be placed along the trail. If a new sidewalk is put in, animal prints can be made in the wet cement and the names put underneath. Or samples of rocks and minerals of Tennessee can be put in the cement or a simple ornamental wall.

NATURE TRAIL

Near your school there probably are trees, shrubs, ground covers, hedges, grass or other growing plants. It is important for the children to be made aware of the growing things around them, to observe the conditions under which the plants live, and to watch their changes through the seasons. The children may also enjoy identifying some of these plants. They can make a "nature trail" which consists essentially of a map showing the location of the plants and a list of their names, keyed to the map.

1. Have children make a survey of the neighborhood near the school to locate any plants that are growing there.
2. Draw a map, with the class, of the area to be used and mark on it the locations of each of the plants included. Number these locations.
3. The children may consult any of the following sources in establishing the identity of the plants: the school plans, the custodian, the school garden teacher, a reference book.
4. List the names of the plants with their numbers. Note also on this list outstanding characteristics of the plants, interesting information about them and a brief description of where they are growing, such as: in the school yard, between the sidewalk and the curb, in a crevice of a wall, in a crack in the sidewalk, etc. It may be possible in some areas to secure permission to place identifying markers in front of each plant shown on the map.

NATURE TRAIL (CONTINUED)

5. Include any other interesting features which may be found in the area, such as boulders, outcroppings of bedrocks, signs of erosion, or animalshomes.
6. Give each teacher in the school a map and the list of plants.
7. Have classes watch for and issue reports on seasonal changes in the plants and the insects and birds which may be visiting or living in them, and on how the plants are affected by these animals and by the weather.
8. Plan to keep this trail accurate and up to date.

VACANT LOTS

A vacant lot is not empty at all, but full of things which tell a story about the ever-changing earth and its resources. Valuable science learnings may be made if the owner of the lot will permit children to dig in the earth.

Features such as beaten paths, elevations and depressions, rocks, plants and animals may be studied in the following ways:

1. Find a path that has been made by the trampling of people's feet. Why did people select this path? Note that often no plants grow where the soil is trampled down, but that there may be plants in low spots where the soil has hot been compacted.
2. Find a variety of common wild plants which may be growing in the lot, such as: poison ivy (every child should be familiar with the appearance of this plant at all seasons), ragweed, dock, burdock, dandelion, English and common plantain, daisy, chickweed, Queen Ann's lace, butter-and-eggs, goldenrod, common reed, wild mustard, yarrow, clover, wild strawberry, Virginia creeper, etc. Note that each kind (species) has certain characteristics which help identify it.
3. Look for signs of erosion. Water may have washed topsoil from high spots to lower ones; gullies may show there running water carried this soil down the slope. Stones may stand on little pedestals of soil which they have protected from the force of raindrops while the bare earth next to them has been washed away. Tree roots may have been exposed as soil washed down a slope. On a breezy day, dry powdery soil may be compared to the dust storms out West.
4. Dig a hole with a spade to determine the depth of the topsoil. Use a hand lens to note that it is composed of mineral particles mixed with bits of plant and animal remains. Compare the topsoil with the subsoil, which consists largely of mineral particles. Have class find leaves and stems that are disintegrating to become partoof the soil. Point out that it may take more than three hundred year for an inch of top soil to form in our climate. Ensuing discussion on the importance of conserving the nation's topsoil is indicated here.
5. Note the size and variety of rocks and stones. Examine them to see if they are natural or man-made and if they were brought from some other place by man.

VACANT LOTS (CONTINUED)

6. Turn over large stones to observe animals living under them. You may find pill bugs, snails, centipedes, ants, and other animals. Replace the stone before you leave. Point out that some animals are adapted to living in the conditions which exist under such stones.
7. Examine the trees in the lot. Is there evidence that any of them developed from seeds of nearby trees? Look for other young trees and shrubs that have grown from seeds that may have been dropped by birds or been blown by the wind. The ailanthus, "the tree that grows in Brooklyn," produces many seeds shich are carried by the wind and germinate under a wide variety of conditions. This tree is often found growing in vacant lots.
8. If you find a stump or a tree that has been cut down, count the rings in the wood, to determine how many years the tree had been growing.
9. Observe the roots of a tree that was blown down. Note the mass of fibrous roots that absorbed moisture and minerals from the soil and the heavy roots whith anchored the tree in the ground.
10. Examine old logs or pieces of wood that are being decomposed by fungi or insects. These fungi and insects are freeing the minerals in the wood, returning them to the soil in the everlasting cycle of nature.
11. Look for woodpecker holes, whichmay be found in dead trees.
12. Look for earthworm casts, little piles of earth left on the surface as the earthworm makes its tunnels. Earthworms are valuable soil-conditioners. They take plant material down into the earth, where it breaks up to help form soil. The tunnels of earthworms admit air and moisture to the soil.
13. Hold a "wild plant" show. Caution the children against poison ivy; allow them to pick a few flowers from other wild plants if the flowers are plentiful. Put them in water. All entries should be labelled. Emphasis should be placed on the variety in individual collections or on their attractive arrangement.
14. Assign a small group of children to a designated square yard of the lot. Have them report the plants, animals and earth forms they find in this limited area.
15. With the permission of the owner, dig up a cubic foot or less of soil, and place it in a box. Let the children spread it on a sheet of paper. Note that humus and mineral particles and examine the plants and animals that are living in the soil.
16. Again with the permission of the owner, dig out a block of soil. Take it back to the classroom and place it in an unused aquarium. Keep it moist, but not wet. A piece of glass laid over the top of it will prevent evaporation; if water condenses on the glass, allow a little air to enter by temporarily removing the glass or leaving an opening. Do not disturb this soil, but observe it daily for signs of animal and plant life.
17. Collect the seedheads of grasses growing in the lot and shake them over a piece of white paper, catching any mature seeds that may drop.
18. Look for signs of mammals: holes, burrows, or trails.

VACANT LOT (CONTINUED)

19. Notice any birds that may be feeding, resting, nesting, or singing.
20. Use an insect net to catch insects. Brush the tops of the grasses and weeds with a net, and in a few minutes you may have an astonishing variety of insects.
21. Examine any rocks that are breaking up.
22. When milkweed is being examined, point out that the juice is rubbery. It is latex and is similar to that which is tapped from rubber trees. The silk of the milkweed flower is sometimes used instead of kapok.
23. Make an autumn display of seed "packages". Let the children pick one each of any seedheads that are plentiful. Note which seeds catch on clothing and which may be scattered by the wind. Exhibit each specimen, and label with name, date and place it was found.

A near by vacant lot can also be used as a Micro-Nature Center.

Questions:

Why use the outdoors as a lab? (see where the actual things are) Their relationship to each other. In a total picture and not just in pieces.

What can we have on the Nature Trail? (the area must be surveyed to see what is already there and what might be added)

If we use land not owned by the school what must we do to be able to use it? Find out owner and get permission to use it. Discuss insurance and how using the area would be like children playing on the playground. The school wouldn't be responsible for anything that happened and neither would the owner of the property.

Could it be used year-round? (The nature trail would be interesting if reset up each lesson of the year with new stations and concepts)

B. If there is a vacent lot in the community or area where houses has been turn down, what about a Vest Pocket park? The Gov. Open Spaces Department has matching money for cities that want to put in small neighborhood parks. Many of these could be used in all areas. If land was available and the need for such a park showed itself it might be possible to start a campaign to get such a park established. Such a park should reflect what the community really wanted. Children should get involved in such a planning. Where it might just be a proposed "idea" with the proper planning and backing it might become a reality.

The children could discuss what they would like to see in such a park. Many times they would prefer to have other than the conventional playground equipment. Many new playgrounds in the East have "objects" (Time did a picture story on one that might be interesting to the children). Construction type blocks, climbing ropes and cargo nets. Railroad ties for balance beams, pipes for play, put together like animals, etc. The children can come up with lots of ideas. These can be drawn and developed into a master plan for a vest pocket park that might be of interest to the local Government.

VACANT LOT (CONTINUED)

B. Questions Continued

Why have Vest Pocket Parks? place to play, away from the streets, a bit of green left in the city:
Where could one be developed? Look over the area around the school to see if there would be a need and a possible area.
What would there be in such a park? Ask the children what they would like, and more from there.
Where would money to build such a park come from? Local sometimes community raises some state or Federal Government.
How does a community get the money from the Government? A plan has to be made up. Where the property is located. If private what the price, would be, what would be needed on the land, How Big is it? Is there a nedd in the community for such a park.

The curriculum possibilities are endless in the activity Language Arts, letters to Mayor and oouncilman suggestion such a park. Making a propossel. Planning the park, talking to people in the community. Math: Size of area, possible cost of park including the price. What would fit into the area. Science: What plants and trees are already there? What should be planted to make the park more beautiful. Social Studies: How would the park benifit the community? What problems might there be? (litter Vandlelism) How could they be overcome?

C. Beautifying the school site

If the students work on the landscaping the school sites there is much better chance that the bushes, flowers and trees will not be torn down. If the children can feel a pride for the site and the things they plant.

Trees can be planted near an erroted slope or in an open area, shrubs around the building. Each class could have an area to plant and take care of. Trees can be bought at a very low price from the Department of Forestry.

This type of project also ties in well with the sutdy of plants and soil. The soil could be tested to see what type of plant would grow best in that area.

CONSERVATION

A child who lives in the city or even on the fringes needs to be alerted to the importance of the preservation of areas not only at school but in his own yard. Soil erosion will mean something to him if it affect his ball field. There are usually many areas on the school site that need some work. Some activities can be done inside the classroom to show certain concepts. Then the class can move out to try to correct the situation with projects.

EROSION

The children might like to take a walk on a rainy day to see that plant roots and leaves help to hold soil.

1. Compare a lawn, a nearby paved area, and an area of bare earth.
2. Note that water is seeping down into the earth in the grassy areas, or, if the soil is saturated, that any water which runs off is clear.
3. Water will be running off the paved area.
4. Water running down the bare area may be brownish, colored by the soil it is carrying.

To learn about the soil on the school site, the children can engage in activities such as those listed below:

1. Watch for soil on the sidewalk and find out where it came from. Probably a gully, large or small, has fromed as rain washed soil down from a bare spot above the walk.
2. Note the texture of the bare soil, examining it with a hand lens. On some hillsides all of the topsoil has washed off and nothing remains but subsoil (grains of mineral with no humus).
3. Watch for piles of black humus or places where this humus has been spreaded on the soil. Humus is added to the bare places where topsoil was lost, so that plants can grow again.
4. Look for tufts of grass on saml1 hillocks of soil that stand above the level of the bare earth around them. These show how fibrous roots of plants hold soil and how their leaves help to protect soil from the force of raindrops.
5. Observe trees and shrubs whose feeding roots are being exposed as the soil washes down a slope. If too much root area is exposed, the plant will die. You may see trees that are leaning over or have fallen because their roots no longer anchor them.
6. Look for anthills. If you note the color and texture of the grains of soil the ants have carried tothe surface, you will know something about the subsoil there.
7. Examine leaves piled up by the wind at the base of a hedge or a fence. If they have been there any length of time, the bottom ones will be disintegrating. Have the children remove the dry leaves on top, until those that have been pressdd against the damp soil are exposed. See if these leaves are decomposing, turning into humus. Sometimes earthworms can be found feeding on leaves at the bottom of the pile. Earthworms are valuable because they take this humus down into the earth and because they create channels that let air and water enter the soil.
8. Examine any pieces of wood that are rotting, becoming humus. Use the hand lens to see the fungi, or the termites and other insects that are breaking down the wood. This will help the children to realize that rich earth is "alive": materials are used over and over again as plants and animals live and die; fungi and insects which break down these materials are performing an essential service by making minerals available for future growth.

CONCEPT: The surface of the earth is continually being changed by erosion. Erosion is the wearing away of the land by the action of water, ice and wind.

You will need a large tub, two yardsticks, a piece of wood about a foot square, and a sprinkler-type watering can.

Explanation: When soil is cared for properly, rain is absorbed more readily by the soil. The presence of soil cover, such as leaves, grass, and mulches of different types, determines how much water is shed from the soil and how much is absorbed. The slope of the land and the force of the water also affect the amounts of adsorption maintained.

Concept: Water affects the surface of the earth as rain falls and flows down hill.

Problem: Does fast-moving water affect the earth's surface more than slow-moving water?

Materials: Large sheets of waxpaper; a metal tray, cookie sheet, or other shallow water-collecting device; pitcherof water; cup of mixed sand and soil.

Procedure: Shape the waxpaper into a cone or mountain andplace it on the tray. Sprinkle some of the sand-soil mixture onto the cone and then pour water slowly from the pitcher onto the mountain. Watch the way in which the water finds its way downhill and the amounts of sediment that are deposited on the tray. Repeat the experiment, but this time pour the water quickly so that the soil is carried in larger quantities more rapidly to the tray.

Explanation: Slow-moving water drops sand and soil along its paths, making river beds higher; fast-moving water carries things more swiftly to different places.

SOIL EROSION BY WATER

Concept: The face of the earth is in constant change.

Purpose of Lesson: To help pupils understand that the earth's surface is changed as running water transports the products of weathering from one place and deposits them in another place.

Introducing the Concept: Say: Even the splash of a tiny raindrop is a soil mover! Conduct an investigation. Set a jar lid or saucer of soil in the middle of a sheet of white paper. With a medicine dropper, release a few drops of "rain" from a height of several feet above on the soil.

Ask: How do the two soiled sheets compare? Why?

Say: At home, or elsewhere, look for evidence of splash erosion. Notice if all the walls of a building are equally clean at ground level. Try to account for the conditions you find. For example: Observe whether the ground is bare or has a grass cover, the kind of soil around the building, and the number of trees nearby. (This lesson might be very effective if taught during a rainy season.)

Developing the Concept: Pupils share any observation of the day before.

Ask: How much soil is moved by rain? How can we find out? Take class outdoors. (After a rain, preferably.)

Say: Look for signs of soil having been moved.

Ask: What signs? (Gullies, trenches, mud puddles, deposited soil and debris around shrubbery, along a fence, orin a low-lying area.)

Say: Try to determine from where the water brought the soil.

Ask: In what direction did the water flow? (Downhill.)

Say: Although we cannot stop erosion, what could we do to help keep soil on our schoolyard? Pupils suggest plant grass, terrace, plant trees, build wall.

Developing the Concept (Continued)

Suggest that the article on the Mississippi River in World Book Encyclopedia might prove helpful and informative.

Extending the Concept: Ask: How much sediment does a stream transport?

At home pupils investigate:

1. Take a sample of water in a jar, from a running stream, then water undisturbed by rain. Allow sediment to settle for a few days.
2. Take a sample of water in a jar from the same stream after a heavy rain. Allow sediment to settle for a few days. (Teams could be organized to study sediment load of several streams draining various watersheds: plowed field, pasture, forest land.)

EXPERIMENTS

WATTLING

Type of Project: Building rip-rap to hold back or slow down eroding hillsides.

Implications:

a. Keeps hillside from washing or blowing away.
b. Oftentimes it provides area for planting trees, brush, or grasses.
c. Usually last long enough for plants, etc., to get a good enough start to hold back the soil on their own.
d. Beautifies camp.
e. Protects hillside trails.
f. Can prevent undermining of building foundations.
g. Allows the water to seep into soil instead of running off.
h. May prevent the rolling of rocks.

Cautions:

a. Start wattling at top of slope.
b. Use long, flexible twigs.
c. Drive stakes as ddp as possible.
d. Do not put stakes too far apart.
e. Do not remove any vegetation or other natural obstacles already there.
f. Avoid wattling in areas where there is a danger to human safety, i.e., across trails and so forth.
g. Do not allow wattling to run down from lack of repair.
h. Allow wattling to remain until the soil is stable enough to support itself, i.e., when young trees, grasses and the like have established themselves.
i. Do not attempt wattling on too steep a slope.

Experiments (Continued)

RETAINING WALL

Type of Project: Designed to slow down erosion on hillsides. May be made either with rocks or logs. Very practical where eroding area is too steep to wattle. May be one wall or a series of small ones.

Implications: (Same as for Wattling)

Cautions:

a. Avoid soft, decomposing rocks and logs.
b. Don not start base with small rocks or logs.
c. Do not build too high and lose stability.
d. Select rocks andlogs easily managed by boys and girls.
e. Watch to see that, as work proceeds, the rocks are not becoming too small preventing height planned.
f. Avoid "stacking." Rocks and logs must be fitted.
g. Be sure base is broad enough to support height planned.
h. Be sure wall has a slight slope toward hillside for added strength.

Retaining Wall (I). ROCK

A rock retaining wall can be constructed with the minimum of tools. A simple rock retaining wall can be built without the use of cement. Large rocks are to be used at the base with the sixe decreasing as they near the top. Small rocks or stones can be used as wedges or plugs behind the wall. The base with the size decreasing as they near the top. Small rocks or stones can be used as wedges or plugs behind the wall. The base rocks should be sunk about four to eight inches into the soil at the base of the wall.

Retaining Wall (II). TERRACED ROCK

Stariway-like arrangement on a hill or slope. Same type of construction as in the larger rock retaining walls. These walls are only built to a height of about three to four feet.

Retaining Wall (III). LOG

This type of log construction can be made by setting four logs upright, two at each end, leaving a space between them where other logs can be set in horizontally to the desired height of the wall.

On this type of wall, end logs should be set with one end buried in the embankment. The retaining logs should be set alternately between these logs and the spaces between should be plugged with large rocks.

CHECK DAMS

Type of Project: Retardation basin. To be built of logs or rocks.

Implications:

a. Slows down stream erosion.
b. Provides pools where fish may be raised for down stream release.
c. Allows soil areas around stream to get more water.
d. Provides a source of water in case of fire.
e. Provides a source of water for wildlife.
f. Provides a source of water for irrigation.
g. Prevents the unnecessary collection of debris down stream.
h. Increase pool life.

CHECK DAMS (Continued)

Cautions:

a. Do not check streams to point where flooding may occur.
b. Do not construct where there is a danger to human safety.
c. Material used should be durable. Decaying or decomposing material prevents the maximum use of this project.
d. Frequent inspection must be made to see if the dam is serving its purpose.
e. If water is actually to be collected, be sure pool bottom will hold water and is not too rocky or gravelly.
f. Be sure dam can withstand a fairly heavey stream runoff.
g. Build check dam at a spot where natural materials along the stream will give added strength to the dam.

GULLY CONTROL

Type of project: The piling of brush in deep gullies (rock also may be used dam style).

Implications:

a. Brush piles slow down erosion.
b. Brush provides shelter for wildlife.
c. Catches soil behind each pile.
d. After gully is almost filled, trees, plants or grasses that are adaptable to the area may be planted.
e. Decomposing vegetation adds to topsoil.
f. Supplies an area for disposal of bramble.
g. Prevents the rain from making direct contact with the soil.
h. Slows water, allowing for better seepage.

Cautions:

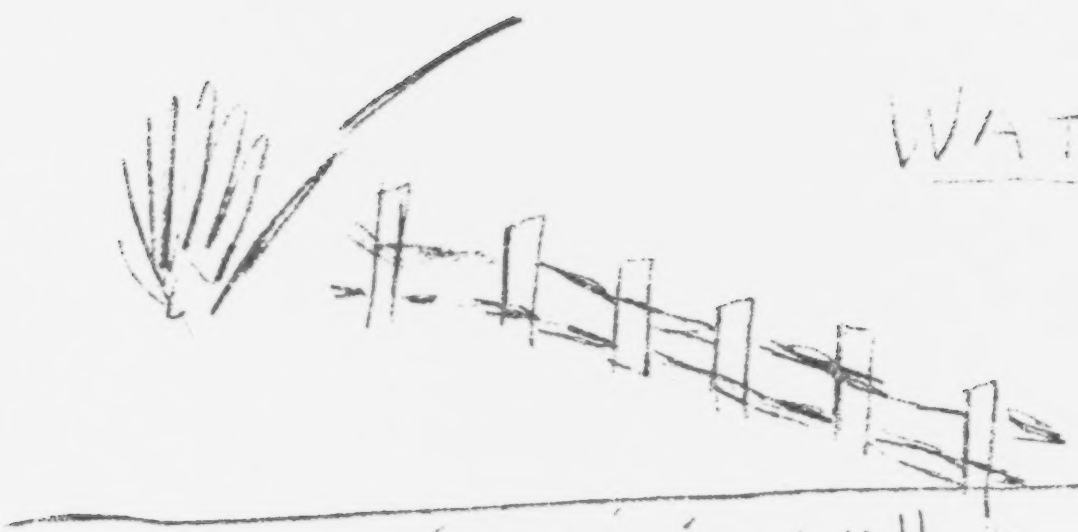
a. Do not use materials that will combust spontaneously.
b. Do not allow it to become a "trap" to people walking in the area.
c. Sharp objects should not point upward.
d. Do not use good material for fill-in that can be better used eleswhere for other projects.

Gully Control (I)

Start at the top of the gully and fill with brush or rock. Gully may also be filled with soil and planted.

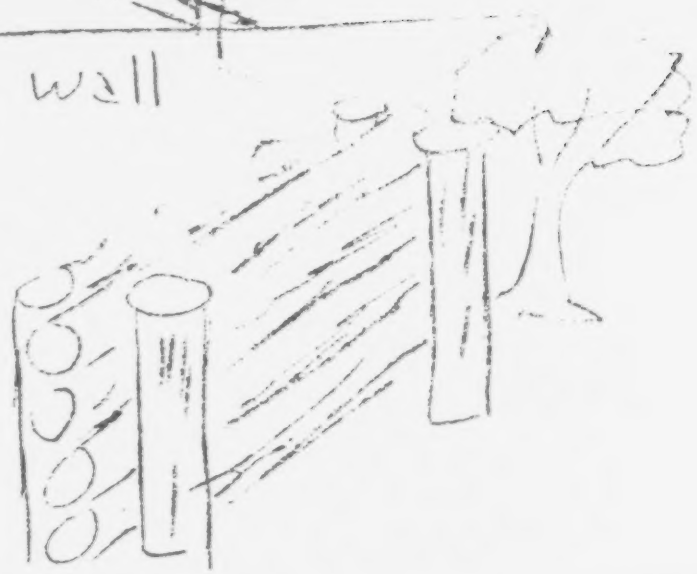
Gully Control (II)

Where gullies are large, where slope of land is ideal, and where a large amount of water passes each year, a water pond of this type may serve for fishing, as a watering pond for wildlife or livestock, and/or the surrounding area may be planted to provide shelter and furnish food for wildlife.



WATTLING

Retaining wall



Gully
Control

EXPERIMENTS (Continued)

SOIL RUN-OFF TEST

1. A method of demonstrating the water holding characteristics of different types of soil and different types of soil coverage

Materials: 2 one-gallon plastic milk cartons, 4 mason jars, 2 tin cans of equal size, masking tape, 2 pieces of wood

Tools: Scissors, nail, hammer, a shovel

Construction:

1. Cut plastic milk cartons so the back is high and the spout is located towards the bottom
2. Punch holes in the tin cans; place the same number of holes in each can in approximately the same pattern
   Place mason jars under each of the milk cartons. To cause rain to fall on the plots, hold tin cans over the soil samples and pour equal amounts of water into each can from the mason jars. Wait a few minutes.

   Now compare the amount of run off in the two collecting jars. Whihh has the most? Why is there more dirt in one than the other? Why is there less water in one than the other?

   Now examine the effect of the "rain" on the soil samples. What evidences are there of erosion?

   Try many different soil samples and mahy ground cover types. Allow the children to conduct the experiments and to draw conclusions. Make sure that they record carefully all of their findings. Then ask the children what general conclusions they can make.
3. Place tape on the outside of the jars and mark off in any number of equal spaces. Do the same for each jar making sure the number of spaces marked off is the same.
   Use: Take samples of different types of soil or soil with different types of ground cover and place in plastic milk cartons. Raise the back part of the milk cartons with a small piece of wood.

Concept: Growing plants and dead leaves protect soil from erosion.

Lead-up Activities:

1. Discuss with the class what soil erosion is and how it differs from soil formation.
2. The process of erosion by nature and how man has caused the problem to increase should be reviewed with the students.
3. Discuss the relationship of slope and ground cover to run-off and erosion tate.

Outdoor Activities:

1. Have the students find as many evidences of erosion around the yard at school as possible. Note possible solutions to each situation.

Outdoor Activities (Continued)

2. After a rain have the students collect water froma nearby stream. Keep the water inside. After a few days collect water from the same stream and compare the samples.

Follow-up Activities:

1. Demonstrate the soil-run-off test and discuss the effects of different types of soil and ground cover used for the test.
2. Discuss how the process of erosion can be constructive in the process of soil formation, but at the same time be destructive to soil which as already been formed.
3. Discuss good practices of soil conservation including the growing of plants on eroded hillsides, contour plowing, planting trees, and the growing of cover crops.
4. The students might locate an erosion problem in their area and look for ways to help solve it. If time allows they should work on the project.

PERMEABILITY OF SOILS

To demonstrate the permeability of different types of soils

Materials: a #10 tin can with both ends cut out, a mason jar, a watch

Use: Sometimes a board placed across the top of the can and pounded with a hammer is needed to place the can in ver impacted soil.
a. Puch the #10 can into the area of soil to be tested (about on inch or deep enough to make sure no water runs out the edges)
b. Fill the mason jar to the top and pour it into the tin can
c. Time how long it takes the water to run out of the can

Ask the children why it takes longer in one type of soil than another. Why does it take longer on a path than in the middle of a field? What does this tellus about the type of soil in the area?

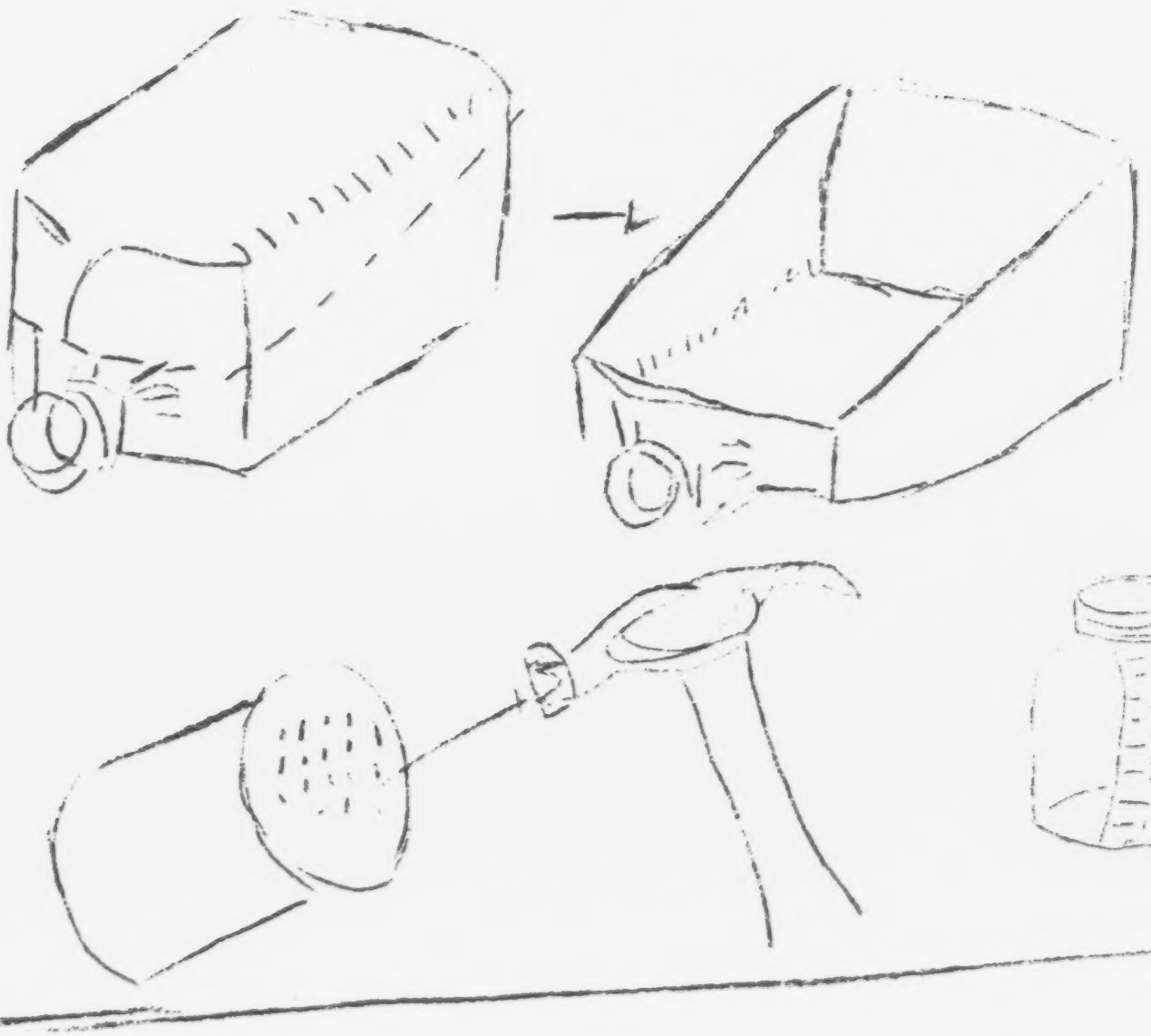
Have the children repeat the experiment in many areas, always being sure touse the samquantity of water. Have them accurately record their findings.

Concept: Soil permeability depends upon ground cover and soil texture.

Lead-up Activities:

1. The students should be made aware that permeability is related to the amount of moisture that can be absorbed by the soil at one time.
2. Have a discussion about the nature of soil permeability and what factors might effect the perculation rate.
3. Make a chart to comepare the permeability rate in different areas. Include wuch information as the general use of the area, ground cover, type of soil, consistency and rate of perculation.

Soil Runoff Test



Outdoor Activity:

Materials: #10 tin can with both ends cut out, mason jar, watch, and a chart to record data

Take the class outside and have them check the permeability to different areas around the school grounds. For each area record the time it takes for the water to be absorbed and the other general information on the chart.

Follow-up Activities:

1. Have the students identify what physical characteristics of the soil might account for the fifferences in perculation rate found in the areas sampled. Factors that might account for these differences include such things as the amount of organic and inorganic matter, composition, consistency, ground cover, and the use of the area.
2. Discuss with the class the advantages of areas where water intake is fast and the disadvantages of an area with a slow perculation rate.

CONCEPT (CONTINUED)

Build a hill of rich soil, pebbles and sand on the wood. Make the hill as high as possible. Pack all the material firmly. Reinforce at the base with pebbles. Lay the yardsticks across the top of the tub about eight inches apart. Place the board on the yardsticks over the center of the tub.

Show how erosion by water wears away the land. Use the watering can to simulate rain. Sprinkle water gently over the hill. Observe the amount of material that settles out in the bottom of the tub.

Show how ground cover can reduce erosion. Rebuild the hill. Cover with patches of moss and one or two low plants. Look for the moss in shady places--around the base of a treeor a large rock. Remove with a thin layer of soil attached. Press firmly in place on the hill. Use the sprinkling can again. Note the change in the amount of material washed away.

Build a variety of land forms--a mountain range. a valley, a plateau. Test each for erosion.

Show how wind erosion changes the land

Use the same materials and plan described in the activity on water erosion. Build a variety of land forms. Test each for wind erosion. Use a small fan. Make a backstop out of a large piece of cardboard. Place the cardboard around the tub on the side opposite the fan. The eroded material will hit the cardboard and fall into the tub.

Vary the strength of the wind. Observe the amount of material that is dislodged and the changes in the land forms.

Ask: What is happening to the sand pile? How is its shape changing? Increase the speed of the fan.

Ask: How is the wind velocity related to the amount of sand being moved? Where is the sand being deposited? Why? Add larger particles of rock materials to sand pile.

Ask: Which particle does the wind move most? Put an obstacle such as a pencil in the path of the blowing sand.

Ask: What changes have been made in the deposition of the sand? Show the film The National Grasslands (story of the rehabilitation of the Dust Bowl area).

Extending the Concept: The day before, ask a pupil to bring to class a square foot of sod, cut from a lawn or field. Suggest that care be taken to disturb it as little as possible. An alternative would be to grow in the classroom a box of thick grass cover. (A spot on the schoolyard could be used in a similar way.) Set up the investigation previously conducted. Substitute the grassy sod for the loose, dry sand.

Ask: How much soil is the wind moving? What makes the difference? What cover protectors could be used to help control wind erosion? Show a reference book or other source book which will motivate individuals to gather information about the Dust Bowl.

Fixing the Concept: Ask: Where would wind erosion be most prevalent? How do desert sand dunes "walk"? Why is wind erosion a problem of the midwestern farmer? What does he do to help control it? What practices are used in our community to retard wind erosion? How does wind work along with other forces to cause erosional effects?

Fixing the Concept (Continued)

(For example, wind and water in hurricanes, tornadoes.)
Say: Wind and the sand it transports can be an effective landscaping team. Suggest that pupils read in the library about Cathedal Spires in Bryce Canyon, Utah.
Instructional Materials

PAMPHLETS
"Early American Soil Conservatonists" Miscellaneous Publication No. 449--SCS

FILMS
The National Grasslands--USFS

MATERIALS
Fan
Box
Sand or soap chips, etc.
Books and pictures which show effect of wind

Concept: A windbreak of trees may reduce the erosion of soil caused by blowing winds.
Problem: What can be done to prevent the wind from blowing away seeds and topsoil?
Materials: Sand table (cooky sheet or seed-flat may be substituted); electric fan; miniature trees constructed from paper and pipe cleaners, or pine cones; dry powdery soil (this often may be procured from an old flower pot which has not been emptied).
Procedure: Spread the soil out into the cooky sheet or seed-flat to simulate a miniature garden. Turn on the electric fan so that a dust storm occurs. Shut off the fan and place a row or two of the "trees" around the edges of the garden. Place them close to each other sothat their edges overlap. Turn on the fan again and notice that this time there is very little soil blown into the air.
Explanation: Farmers who plant many acres of land, shelter this land from wind erosion by planting rows of trees near the land to stop the wind. Often, many rows of trees of many sizes are necessary to obtain the proper shelter for the land. In city parks and on expressways, trees are planted as a windbreak to prevent soil erosion.

Concept: The amount of water absorbed by an area during a rainstorm is dependent upon the substance the area is made of, and also the slope of the area.
Problem: Which types of materials absorb water best?
Materials: Sponge, bottle of water; sheets of plastic, masonite, and glass; box of sand; shovel of grass sod.
Procedure: Pour the water over the sponge and other listed materials to determine which ones abaorb water best. Then hold these materials on a slant and try to discover whether the tilting affects the shedding and absorption of the water. Record in order of absorbency the materials and the degree to which slanting affects their absorbency and swiftness of water shedding.

PLANTING

Type of Project: Planting of any type of vegetation; includes seed collecting, nursery development and transplanting.

Implications:

a. Prevents erosion through plants holding soil and creating windbreaks.
b. Improves the wildlife habitant of the area.
c. Improves the watershed, especially after fire.
d. Feeling of doing something of lasting value and deep meaning for the children.
e. Important task for the benefit of others.
f. Provides fuel for future use.
g. Provides opportunity to learn about watering, weeding and general care of plants.
h. Will eventually allow area to self-reproduce its own cover.
i. Willenventually produce additional humus and topsoil.
j. Adds beauty to camp area.
k. Makes for additional recreational opportunities.
l. Increases potential lumber supply.
m. Prevents splatter erosion.
n. May pioneer the development of additional types of vegetation.

Cautions:

a. Do proper planting; otherwise wasted time.
b. Be sure to select the proper type of plant forthe area chosen.
c. Know the type of plant you are trying to plant.
d. Choose proper plant for sun and shade.
e. Know the amount of water required by the plant.
f. Know the type of soil required.
g. Know temperature range required for growth and reproduction.
h. Avoid over-crowding, expecially with trees and shrubs.
i. Planting of trees and shrubs should not be where they may become a hazard to safety.
j. Seek assistance and advice drom local resource people.
k. Be sure to not keep too much moisture in seed cans when seeds, such as acorns and pine nuts, are collected and planted in selected cans. Too much moisture will cause the seeds to rot.

Tree Planting

After hole is dug:

1. Refill and tamp soil;
2. Place plant (remove container if directed);*
3. Add soil and tamp;
4. Same as (3);
5. Same as (3);
6. Build watering basin if needed.

*Plants may be put in ground while still in nursery can. Simply cut out part of bottom of the can before placing it in the ground. The can is also useful in watering the young plant to help it get started, as it concentrates the water about the root system.

UNIT V

SPECIAL PROBLEMS

In some communities there are special problems dealing with the environment. The following are only a few of possible problems. In order to make the children aware of these problems, they should take a long look at their community. They may bring up problems that are not noticeable to the teacher, who doesn't live in that community. Once the children become aware of the meaning of pollution, of litter, and of health problems, they are more likely to be able to find examples in their community. These should be discussed and possible solutions brought out. This is where the real learning takes place. Some possible problems---

A. Rats

In the inner city and even in the suburbs there is always the danger of rats. It is important to work on this problem through the home and community because it takes a combined effort to get rid of this pest.

Questions:

Why are there so many rats in the city?
(When the city was built the shelter for the rat predators was destroyed. Such animals as fox, snake, owl, and hawk disappeared from the area. This allowed the rat to multiply. The city rat is an imported rat coming to the country by way of ships. He adapted very well to the city.)
What do rats need to live and breed?
(Rats, like all animals, need food, water, and shelter.)
Why are rats so bad?
(Dirty - spread disease - Discuss some of the diseases.
Bugs on them bad also)
How do we get rid of rats?
(By taking away their food and shelter, using poison to take the place of the predators - food in garbage - shelter in junk)

Activities:

How can children help?

1. Survey the community; see if there are spots where rats could find food and shelter. Organize a Rat Patrol. Material is available from the Health Department that can be given to people in the community.

2. Make sets of canisters (coffee and other cans with tops), covered with wall paper or contact paper to be used in each student's home - to house food usually left in a bag, food that rats like.

3. Have each child survey their home for any holes, etc. Rat holes can be stopped up by nailing tin over them. The metal can be obtained from the cafeteria - tops from # 10 cans.
Beside spreading disease, why are rats so destructive?
(Rats are Rodents. The front teeth of rodents continue to grow. The rat must keep gnawing in order to keep the teeth ground down. If this is not done the teeth could grow through the lower jaw and kill the rat. He will knaw all of the time, not just to make a shelter or find food.)
Why are we getting more rats in our house if we don't leave food out?
(In some areas houses are being torn down. The rats that used these

older houses for shelter are seeking another place to live and will go to the nearest house. Some trouble has been noted where houses have garbage despossals. The garbage put down the desposal attracted rats through the sewer and they investigated. Since they could not come up through the sink they got into the house through the commode. The Health Department is trying to find something that can be put into the desposal with the garbage so it will not attract rats. The problem could happen to anyone.)

4. The easiest way to take away food from rats is to put the garbage in cans with a lid. Problems, however, will often come up in regard to garbage cans. Some ome of the suggested activities to do with certain problems are as follows:

a. My can gets stolen
The Rat Patrol can stencil a person's name on the can. This will cut down somewhat on the stealing.

b. The lid to my can gets banged up and lost
Many neighborhood stores, at the suggestion of the Health Department, are stocking garbage can lids to be sold separately. If a store in your community does not do this, one should be approached about it.

c. Dogs knock my cans over
The children can show the residents of the neighborhood a simple wire (from coat hanger) holder that keeps the lid on. In some areas, the Housing Athority will bring scrap lumber to the schools or residence. This can easily be made into racks for gar bage cans. This would be a good project for 6th grade boys or high school industrial art shops.

d. The garbage collectors bang up my can
The reason for this seems to be that many people throw their garbage into the can without putting it into bags. It sticks to the bottom of the can and the collectors bang the can on the truck to break loose that garbage stuck on the bottom. If all garbage was put into paper bags, this would not be necessary.

e. Trash and old cars, etc. in vacant lots and alleys are good shelters for rats.
The Health Department, with the money from the Government as well as City Beautiful, will collect junk. They will not pick up pieces along the sides of streets, in alleys or lots. This litter and junk could be collected into a pile by the children; use rakes or big plastic bags; then it can be collected by the trucks.

d. Will just killing the rats do the job?
The area must also be sprayed to get rid of the lice and fleas that were on the rats. They will seek another home on a dog, cat, or human. Rats will continue to multiply unless their food and shelter is taken away from them.

The Health Department has a great deal of material that they will give the schools and they also have a film program to be shown.

The Outdoor Education Department has directions for the canister sets and a special Rat Patrol song for the children.

Posters and programs can be used to help educate the children and parents about rat control.

References: Metropolitan Health Department

Book, Rats and Mice by Silverstein, Lothrop Publishing Company

B. Odors From Factories, etc.

In some areas there are factories that burn or release odors. This is not only air pollution but very disagreeable to all who live nearby. If such a problem exists, it is well to , not only discuss it with the children, but bring it to the attention of the authorities and alert the community to the possible ways to combat it.

1. What is causing the odor? Find out what is being made at the factory - rendering feed, chemicals, etc.
2. Why is it bad?
   (Aside from the unpleasantness of the odor, the particles in the air could be harmful, not only to people, but to birds and other animals.)
3. What could be done about it?
   (This could take some research but there are methods that can be used to re-cycle the smoke or a different method to get the job done.)
4. Is it against the law?
   (All pollution over a certain amount is not against the law. The Health Department has a list of such laws and how much is allowed)
5. How else is this factory polluting the area? Check for pipes allowing waste to go into water, open areas, etc.

All this works in well with the Air Pollution Unit. A survey could be made as to how many days in two weeks that the wind blows the odor and/or smoke towards the school.

C. Vacant Houses - Junk

In many areas houses are being torn down for highways, new houses, or other projects. Too often most of the junk is left for a period of time without being removed. This is a form of pollution, and the problem should be discussed.

1. Where is the torn down house and/or junk going? What happens to it?
   (Usually the companies that bid on the demolition will resell the building material. The junk that cannot be reused is usually burned (more air pollution).)
2. Why do they take so long?
   (The companies are many times small businesses and do not have a lot of man power.)
3. What could be done with the area that is left?
   (A bulldozer could smooth over the lot and something could be grown there until it is finally used for a house or building. Donated flowers or grass seed could be planted on these by the children.
4. How else are such areas an environmental problem?
   (Rats that have lived in the building will seek shelter elsewhere. Parts of building left standing will become a hazard; glass, nails, etc. will be left behind. This would be a good discussion on safety; stay away from the area.

These areas should be considered in the Land Use Unit for possible playgrounds or outdoor laboratories.

D. Hazards - No Sidewalks, Traffic Problems, Dumps

In many areas there are hazards that affect the children walking to school. This is particularly true in the suburbs where there are no sidewalks. This is an environmental problem and should be discussed by the children. Other neighborhood problems might include dumps nearby, undesirable people living near the shcool, and heavy traffic problems.

1. If there are no sidewalks near the school, the following things can be done:

Where are children walking? If on edge or shoulder, is it wide enough? Do they fully understand the safety rules for walking on a road or highway and why?
Make a car survey early in the morning and after school to determine about how many cars and trucks pass the school at the time the children are walking to school.
Discuss who's responsibility would it be to put in sidewalks? (This is a debate now between schools and local government)
How far would it have to extend to be safe?
(Measure the proposed area)
Would the sidewalk help the entire community? How many children in the school have to walk down the highway or road? What are their ages? Have any been hurt?
What has held down the possible accidents?
(Training and the patrol mothers and members)
How could a community get a sidewalk?
(By working through the councilman, letters to authorities, and making the problem known.)

2. Dumps

Often a fill or dump is put near a school or in the community. As a problem, this can be used for discussion and possible action.

Why is the dump necessary?
(Trash must be put somewhere)
Why is it bad for the community?
(Eyesore, possible source for rats; if burned, air pollution; if children play around it, they could be cut or injured)
If the dump was not there, would that be a hardship to anyone?
(The disposal of waste is a great problem. Some areas do not have a pick up service and have no place other than a dump to bring their trash and garbage. Too many people, instead of taking the trash to a dump will drop it along the road, creating a hazard and a pollution problem. New ways MUST be found to dispose of trash.)
What is the difference in a dump and a land fill?
(A land fill usually has only trash, rocks, dirt, no garbage. Soil will be used to cover the area as soon as the depression has been filled. The land can then be used and much of the trash will go back to soil. A landfill is ONE method of using trash that can be good.)
What can be done to have a dump removed?
(It would have to be proved that it was a hazard to the community and since it might be necessary a new dumping place not so close to people living would have to be found.

There are many other possible environmental problems in a community that can be used for discussion and possible solutions. The children MUST get involved if the learnings are to be complete. Talk is not enough. There must also be action.

UNIT VI

RELATED ACTIVITIES

Conservation songs - one is included with the manual
Posters on all areas of the environment
Bumper stickers - stick on papers may be obtained as scrap from many printers - use Indian ink or magic marker - spray with plastic spary
Write stories and illustrate on "What I want in my community".
Write letters about problems in your community to the proper Councilman, to the Mayor or the Governor.

All the results of the activities and observations should be put into a booklet for the school. Hopefully, this will be given to the right people. Take pictures of the projects - before and after, and while the children are working.

Discuss population and its effect on pollution. What must be done about it?

This is not a single week or month type of project. These are just a few activities that should be carried on each year during a child's schooling. Only by this kind of learnings can we hope to educate the future citizens of our land to understand, appreciate, and take care of our environment.

The material in this manual has been adapted from any sources. The following have been particularly helpful:

Teaching Conservation and Natural Science in the Outdoors, California Association for Outdoor Education
Environmental Education Field Studies, Puducah Public Schools, Puducah, Ky.
Water, The Waste of Plenty, John Raffo, Conservation and Environmental Science Center, Southern New Jersey
Learning in the Out of Doors, Pennsylvania Outdoor Education Association
People and Their Environment, Teacher's Guild to Conservation Education, 4-5-6 and Outdoor Laboratory 1-2, Ferguson and Company
Teaching Elementary Science, Langley, Parker
Elementary School Activities, Nelson, Prentice Hall
Operation New York - Using the City as a Resource, Board of Education, NYC.